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Artigos

A study about the quality of the services provided by a technology laboratory

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Abstract

The aim of this research was to investigate how customers of a technological control laboratory of civil construction materials perceive the quality of the services delivered by the laboratory, specifically, what concerns the service of ceramic brick and concrete blocks breaking. The SERVQUAL scale was used as reference for the application of a survey and, by means of an Exploratory Factor Analyses, the dimensions and attributes that comprehend this service were evaluated. As a result, 20 attributes grouped in three dimensions Responsiveness, Assurance and Reliability) were found, what has resulted in an explained variance of 77.621%and that characterize these dimensions as a modified SERVQUAL scale. From the results, it was possible to identify the existing discrepancies in service quality, since all gaps between the expectations and perceptions of services have resulted in negative values. The developed study is relevant by bringing contributions concerning the quality assessment of ceramic brick and concreate block breaking services provided by a technology laboratory. The assessment to the results can add value in the customer service and, consequently, empowering the increase of satisfaction.

Keywords: service quality, service quality dimensions, SERVQUAL scale, civil construction, technology laboratory.

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1 Introduction

As strategic part of a company, developing long term and profitable relationships with clients is a goal that has received attention from researchers that look for the understanding of the necessary requirements to stablish such relation (Gounaris, 2005; Caruana and Ewing, 2010). This way, the level of quality in which a company delivers its service to customers and clients is a central question that deserves attention (Gounaris, 2005). It is considered a determinant factor of business performance and the viability of companies in a long term perspective (Bolton and Drew, 1991) and, therefore, it has been used as strategic alternative to consolidate and increase companies' performance (Grönroos, 2007).

Service quality reflects clients' satisfaction (Yang and Peng, 2008), what, in turn, has positive impact in word of mouth publicity, in his loyalty attitude and future repurchase intention (Gremler and Gwinner, 2000; Zeithaml, 2000; Oliver, 2014). It is an important and strategic variable in decision models and must help managers develop strategies to conduct their activities based on logic, timely and trustful information (Zeithaml, 1988; Cronin Jr. and Taylor, 1992; Juran and De Feo, 2010).

The University of Caxias do Sul (UCS) counts on about 670 laboratories, and one of them is LBTEC (UCS Technological Laboratory), which serves the area of technological assays in construction materials. The LBTEC develops business relations as partner and service provider between the university and companies of the civil construction sector, contractor companies and concrete companies. Currently, more than a hundred client companies of the laboratory seek for services related to the materials and construction components quality control, like concretes, grout, concrete blocks and bricks. It is also part of the laboratory scope the evaluation of acoustic performance of vertical and horizontal seals systems. Specifically, the concrete technological control, it is the ceramic brick and concreate block breaking, that aims to evaluate and certify the compressive strength specified in each construction material.

Because of that, the research had as main objective to evaluate the quality of services performed by the LBTEC (Construction Technology Laboratory), more specifically in the segment of ceramic brick and concreate block breaking. Additionally, the following specific objectives have been stablished: adequate the SERVQUAL scale to the study context; evaluate the perceived quality related to the services provided to the clients of ceramic brick and concreate block breaking by means of the attributes and dimensions of the SERVQUAL scale; identify quality gaps, in the sense of directing the segment companies to maximize the clients' satisfaction; propose directions in the sense of enable the improvement of the quality perceived by clients in the context market.

As an alternative to evaluate the quality of services provided in the study context, it was started from the use of a consecrated scale, the SERVQUAL scale (Parasuraman, Zeithaml and Berry, 1988), seeking to answer the following central research question: How are the dimension and following attributes of service quality of ceramic brick and concreate block breaking provide by LBTEC evaluated? Aiming at meeting the proposed objectives, first, the theoretical framework will be presented that embraces the considerations concerning service quality, customer satisfaction, as well as the dimensions of service quality. Next, the research method is presented, the results analyses and, finally, the final considerations.

2 Theoretical framework

Services are offers that may be sold for customers and companies and, sometimes, both. They differ from tangible products due to three main characteristics: (i) intangibility, the service is mainly a process and not an object; (ii) heterogeneity, the service experience may vary each time it is delivered and, (iii) simultaneity, the services are normally produced and consumed simultaneously (Jhone and Storey, 1998). According to this, the service requires that there is interaction within the customer or the company which the service is being performed and it is this interaction that distinguishes the service offers (Edvardsson, 1998; Jhone and Storey, 1998) and also allows the evaluation by the customer or client of the service quality (Ganguli and Roy, 2010). The services bought by organizations (B2B) are provided by qualified professionals in which their skills and knowledge are key elements of the performed service quality (Gounaris, 2005).

In this direction, the services provided by a technology laboratory, as LABTEC, are considered knowledge intensive business services, which means that these organizations (laboratories) use the knowledge of professionals related to a technical and specific field, generating intermediary business (products or services) that belong to knowledge (Hertog, 2000). Also, knowledge intensive business services can be defined as the services provided by a company that serves to find solutions based on specific knowledge to other companies (Miles, 2005). This way, this kind of service and the accuracy of the results prevenient from them are extremely important for the client and its business, so is the importance of the quality of the service delivered by the service provider.

Despite the difficulty in getting to a consensus to define service quality, it is possible to conclude, from the perspective of different authors, that such concept refers to providing something intangible in a way that pleases the customers (clients) and that, preferably, delivers value to this customer (client) (Edvardsson, 1998; Brysland and Curry, 2001). There is not a consensus on the appropriate level of service and the idea of excellent service quality implies that every customer (client) is important and that every expectation must be met or exceeded. However, it depends on how much the expectations are sensate or not. What is apparent is that the customers are directly and immediately affected by mistakes in the service delivery process (Brysland and Curry, 2001; Moscynski, 2010).

Perceived quality is understood as the result of the difference between the customers' perceptions and the expectations, and must be measured by means of the difference between the expected quality and the experienced quality by the customer (Grönroos, 1984; 2007; Oliver, 2014). For Grönroos (2007), perceived quality is defined from two service quality dimensions: the technical quality, concerns to "what" the customer gets in his service meetings, and the functional quality, that is related to the process of service delivery, or "how" the customer receives the service.

This way, it is possible to assume that quality is a result derived from a judgment of the customer, making it essential to know his expectations and perceptions, enabling, in this case, a comparison between the expected service and the perceived one (Parasuraman, Zeithaml and Berry, 1996; Forsythe, 2008; Oliver, 2014). Therefore, perceived quality is important because it is related to satisfaction, which is known for positively influencing the companies' performance. As Garikaparthi (2014) says, customer satisfaction is a result of service quality and the satisfaction of the customer is responsible for determining the future intentions and behavior of the customer towards the service and the provider. The general

satisfaction with a service is due to the customer satisfaction degree with a variety of aspects of the offered service, and service perceived quality follows the same line (Gounaris, 2005).

The mensuration of service quality allows comparisons before and after changes, as well as to identify the problems related to quality and the establishment of service delivery patterns (Brysland and Curry, 2001). By contemplating service quality, ways to measure and follow it have emerged, what is essential to evaluate its performance (Parasuraman, Zeithaml and Berry, 1985; 1988; 1991; 1996; Cronin Jr. and Taylor, 1992; 1994a; 1994b; Teas, 1993; 1994).

The SERVQUAL scale (Parasuraman, Zeithaml and Berry, 1985; 1988) is the most known and researched scale that concerns service quality and focuses on the human interactions during the service delivery (Ganguli and Roy, 2010). Recently published researches can be found in electronic databases demonstrating that the use of SERVQUAL is still alive (Martin, 2016). It is an applicable and practical tool for service provider organizations and companies in order to appraise the perception of the customers about the quality of a service that was delivered (Parasuraman, Zeithaml and Berry,1988).

Such scale is structured from the existing difference between the previews expectations in relation to the service and the customer's perceptions in relation to the provided services.

The SERVQUAL scale is structured by five dimensions, that are: Reliability, ability to perform the service safely and precisely; Responsiveness, ability to be helpful and help the customer in his needs; Assurance, attitude that instills confidence and makes the customer feel free of dangers and doubts about the service; Empathy, individualized care and attention and; Tangibles, physical facilities appearance, equipment, material and staff (Parasuraman, Zeithaml and Berry, 1985; 1988).

3 Research method

There are a lot of studies that have applied the SERVQUAL scale and shown that the analysis of data can take different forms, like dimension-by-dimension analysis to identify the dimensions on which customers place more importance and those on which they perceive that the company perform well or poorly (Souca, 2011).

For the research operationalization, a quantitative methodological approach was applied, by means of a survey (Fowler Jr., 2009; Fink, 2012), structured from the adaptation of the original SERVQUAL scale (Parasuraman, Zeithaml and Berry, 1988). The content analyses validity (Malhotra, Birks and Wills, 2012) have been performed by submitting the data collection instrument to four experts on the field, which has resulted in textual adjustments. Besides, a pretest was performed (Malhotra, Birks and Wills, 2012; Hair Jr. et al., 2010) and was applied to two respondents that were part of the desired population. As a result, there were no implications concerning the method or research questions. The pretest questionnaires were not incorporated to the final sample.

In relation to the data collection method, first the respondents were contacted by telephone to be told about the research and an interview appointment be scheduled. On scheduled day and time, the researcher called the respondent that received an e-mail link to answer the research. While the respondent marked the answers on his computer, the researcher helped answering the questionnaire. In the end, the filled questionnaire was sent out to the data base.

For initial data treatment, the missing incidence was verified (there were not variables with more than 10% non-answer index, while the ones that presented index below 10% the mean of the answers were adopted) (Davey and Savla, 2009;

Enders, 2010; Hair Jr. et al., 2010; Malhotra, Birks and Wills, 2012). For data analyses, the Exploratory Factor Analyses (EFA) was applied (Johnson and Wickern, 2007; Mulaik, 2010; Gorsuch, 2015). Aiming at identifying the dimensions of service quality that the identified attributes could be grouped, the Principal Component Analyses was applied (also as factor loading extraction method) to examine the set of interdependent relations (Malhotra, Birks and Wills, 2012), explaining the covariance and correlations among variables (Johnson and Wichern, 2007; Mulaik, 2010; Hair Jr. et al., 2010), grouping them in factors (dimensions). To obtain the factors that translate groups of attributes related to the construct in analyses, the eigenvalue equal or superior to 1 was adopted (Hair Jr. et al., 2010; Malhotra, Birks and Wills, 2012; Gorsuch, 2015), without previous definition of factors number.

To facilitate the interpretation of the dimensions, it was applied the non-orthogonal method of oblique factor rotation Oblimin (Hair Jr. et al., 2010; Mulaik, 2010; Gorsuch, 2015). Additionally, the Bartlett's sphericity test and the Kaiser-Meyer-Olkin (KMO) tests were performed. It was also analyzed the scale reliability, from the identified dimensions (comprehended by their following attributes), based on two tests: Cronbach's Alpha and composite reliability (Hair Jr. et al., 2010; Remler and Van Ryzin, 2011; Malhotra, Birks and Wills, 2012).

Considering that the Cronbach's Alpha uses the scale items in a unidimensional way, where all the items are correlated (Gerbing and Anderson, 1988; Voss, Stem Jr. and Fotopoulos, 2000), when characterized as a measure, this tends to be inflated given the way it treats the mistakes associated to the indicators (variables), what makes it less reliable (Finn, 2000). Therefore, besides the extracted variance and the Cronbach's Alpha, it was also opted to analyze the composite reliability (Hair Jr. et al., 2010; Remler and Van Ryzin, 2011; Malhotra, Birks and Wills, 2012).

4 Research results

4.1 Sample

The total population of clients of ceramic brick and concreate block served by the LBTEC is of 42 clients/companies, 17 of ceramic brick and 25 of concreate block. Seven out of the 42 clients were not able to be contacted, they either were not reached by phone or e-mail, so they did not participate in the research. Other 5 clients do not work with certification, and also could not be considered as part of the sample. Therefore, according to Table 1, the sample was of 30 respondents, with 71.43% of return in relation to the potential respondents.

Table 1: Respondents

Population	Sample	% of Sample	Valid Cases	Valid %	% in Total Sample
42	30	71.43%	30	71.43%	71.43%

Source: Data from the research.

4.2 Modified SERVQUAL Scale Applied and Dimensions Found

Table 2 presents the 21 attributes used to verify the quality of the services in analyses and related to the five dimensions of the original SERVQUAL Scale.

Aiming at depurating the scale, it was proceeded the analyses that have indicated a better explanation power impacting in three dimensions of the evaluated services quality, not five as proposed earlier, which were named Responsiveness, Assurance and Reliability. The attributes with factor loading under 0.5 were removed (Hair Jr. et al., 2010). This way, the item RL3 "Be trustful" did not present explanation power, and was re-

Table 2: Adapted SERVQUAL attributes

Dimensions	Attributes related to quality of the evaluated services	Items
Tangibles	Up-to-date equipment.	TG1
	Visually appealing physical facilities.	TG2
	Well dressed and good appearance staff.	TG3
	LBTEC has adequate physical facilities to the kind of service performed.	TG4
Reliability	Provide results in a clear and easy way.	RL1
	Helpful staff when the clients have a problem.	RL2
	Be trustful.	RL3
	Provide the service up to the promised deadline.	RL4
	Keep correct and up-to-date registers.	RL5
Responsiveness	Inform client exactly when the work will be carried out.	RP1
	Staff who have the knowledge to provide immediate answers to clients' questions.	RP2
	Staff willing to help the clients.	RP3
	Staff whose behavior instills confidence in client.	RP4
Assurance	Staff make clients feel safe in negotiations.	AS1
	Staff who are polite with clients.	AS2
	Staff get support, training and proper orientation to perform well the job.	AS3
Empathy	Offer individualized care to clients.	EM1
	Staff who give personalized attention to clients.	EM2
	Staff who know how to identify the clients' needs.	EM3
	Have the client's best interests at heart.	EM4
	Flexible business hours.	EM5

Source: Data from the research.

moved. Therefore, 20 items or attributes that compose the three dimensions of the services ofered by LBTEC remained and are explained by a total variance of 77.621%.

The incidence of three and not five dimensions, as proposed by the original SERVQUAL Scale, can be a result of the small sample (30 respondents). Although the number of respondents is considered enough to proceed with this kind of analyses, it might have interfeered in the quality of the results. Other possible reason is that the respondents only identify three of the five dimensions in the service they experience. In this direction, Matzler, Renzl and Rothenberger (2006) have found in their study, when applying the SERVQUAL Scale, that the five dimensions of service quality differ in their relative importance when considering customers' overall satisfaction in the hotel industry. Addicionaly, in the literature, studies like the one by Jeon, Dant and Gleiberman (2014), have chosen to use just three of the five dimensions in their study, that are Reliability, Security and Tangibility. Either way, the results are presented in Table 3, which demonstrates that, both the factor loading values and communalities are greater than 0.5.

The results of Cronbach's Alpha, composite reliability and extracted variance used to analyze the internal consistence of the data for each of the three dimensions identified can be found in Table 4.

The values of the Cronbach's Alpha are considered satisfactory for the dimensions Responsiveness and Reliability, because they are values between 0.866 and 0.971, on the other hand, the dimension Assurance did not present a Cronbach's Alpha value because it only retained one item. As to the values of composite reliability, they all presented values above the recommended, that is 0.7 (Hair Jr. et al., 2010; Malhotra, Birks and Wills, 2012). For the extracted variance, the dimension Reliability showed value under 0.5, which is the literature recommendation.

The three dimensions found can be associated to constructs. To facilitate a comparison, Table 5 presents the related attributes and their following dimensions, both in relation to the original SERVQUAL scale and the results of the research.

Table 3: Service quality dimensions and attributes

Attributes related to services		Dimensions (Factors) Identified			Communalities
		1	2	3	
TG1	Up-to-date equipment.			-0.908	0.731
TG2	Visually appealing physical facilities.	0.582			0.727
TG3	Well dressed and good appearance staff.	0.779			0.541
TG4	LBTEC has adequate physical facilities to the kind of service performed.			-0.569	0.747
RL1	Provide results in a clear and easy way.	0.870			0.828
RL2	Helpful staff when the clients have a problem.			-0.518	0.717
RL4	Provide the service up to the promised deadline.	0.628			0.772
RL5	Keep correct and up-to-date registers.			-0.603	0.832
RP1	Inform client exactly when the work will be carried out.	0.812			0.766
RP2	Staff who have the knowledge to provide immediate answers to clients' questions.	0.846			0.758
RP3	Staff willing to help the clients.	0.711			0.683
RP4	Staff whose behavior instills confidence in client.	0.900			0.757
AS1	Staff make clients feel safe in negotiations.	0.614			0.877
AS2	Staff who are polite with clients.	0.932			0.836
AS3	Staff get support, training and proper orientation to perform well the job.	0.888			0.839
EM1	Offer individualized care to clients.	0.645			0.850
EM2	Staff who give personalized attention to clients.	0.698			0.818
EM3	Staff who know how to identify the clients' needs.		0.940		0.887
EM4	Have the client's best interests at heart.	0.812			0.765
EM5	Flexible business hours.	0.998			0.794
Eigenvalue		12.958	1.449	1.117	% Cumulative Variance
% Explained Variance		64.791%	7.244%	5.586%	77.621%

Note: KMO: 0.610. Bartlett Test of Sphericity: Q Square: 663.875. GL: 190.000; sig.: 0.000.
Source: Data from the research.

Table 4: Cronbach's Alpha, Composite Reliability and Extracted Variance

Dimensions (Factors)	Cronbach's Alpha	Composite Reliability	Extracted Variance	Items
Responsiveness	0.971	0.961	0.625	15
Assurance	0.000	0.883	0.883	1
Reliability	0.866	0.753	0.445	4

Source: Data from the research.

Table 5: Comparative between dimensions and attributes (original SERVQUAL and modified)

Original dimensions (SERVQUAL Scale)	Dimension (Factor) 1	Dimension (Factor) 2	Dimension (Factor) 3
Responsiveness	TG2, TG3, RL1, RL4, RP1, RP2, RP3, RP4, AS1, AS2, AS3, EM1, EM2, EM4 and EM5		
Assurance		EM3	
Reliability			TG1, TG4, RL2 and RL5

Source: Data from the research.

4.3 Gaps of Quality

In order to provide practical recommendations and compare the levels of perception and expectations of the LBTEC's clients in relation to the ceramic brick and concreate block breaking, the existing gaps of the difference between perception and expectation are presented for each construct, what is shown in Table 6. The importance and perceptions of service quality dimensions were analyzed so that managers of technological laboratories may draw conclusions about how to improve service quality and, consequently, customer satisfaction.

To verify the gaps for each of the 20 attributes (variables) that compose the three dimensions (factors) of the analyzed service quality, Table 7 is informative.

Based on these results, therefore, it is possible to identify the gaps between the clients' expectations and perceptions concerning service quality, as well as its magnitude. In all attributes the gaps are negative, what indicates that the expectations are always higher than the perceptions. The dimension that presented higher gap was Responsiveness (-0.815) followed by Reliability

Table 6: Gaps of quality for the identified dimensions

Dimensions	Expectations (Mean)	Perception (Mean)	Gaps
Responsiveness	5.272	4.457	-0.815
Reliability	5.126	4.420	-0.706

Source: Data from the research.

Table 7: Gaps of quality for the attributes

Dimensions	Attributes related to evaluated services	Expectations (Mean)	Perception (Mean)	Gaps
Responsiveness	TG2 (Visually appealing physical facilities.).	5.233	4.448	-0.785
	TG3 (Well dressed and good appearance staff).	5.333	4.552	-0.782
	RL1 (Provide results in a clear and easy way.).	5.433	4.586	-0.847
	RL4 (Provide the service up to the promised deadline).	5.333	4.724	-0.609
	RP1 (Inform client exactly when the work will be carried out.).	4.900	4.690	-0.210
	RP2 (Staff who have the knowledge to provide immediate answers to client's questions).	5.300	4.714	-0.586
	RP3 (Staff willing to help the clients).	5.310	4.552	-0.759
	RP4 (Staff whose behavior instills confidence in client).	5.367	4.586	-0.780
	AS1 (Staff make clients feel safe in negotiations).	5.433	4.310	-1.123
	AS2 (Staff who are polite with clients).	5.633	4.586	-1.047
	AS3 (Staff get support, training and proper orientation to perform well the job).	5.367	4.448	-0.918
	EM1 (Offer individualized care to clients).	5.233	4.138	-1.095
	EM2 (Staff who give personalized attention to clients).	5.069	4.036	-1.033
	EM4 (Have the client's best interests at heart).	5.067	4.310	-0.756
	EM5 (Flexible business hours.)	5.067	4.172	-0.894
Assurance	EM3 (Staff who know how to identify the clients' needs).	5.100	4.195	-0.905
Reliability	TG1 (Up-to-date equipment).	4.933	4.600	-0.333
	TG4 (LBTEC has adequate physical facilities to the kind of service performed).	5.300	4.345	-0.955
	RL2 (Helpful staff when the clients have a problem).	5.172	4.241	-0.931
	RL5 (Keep correct and up-to-date registers).	5.100	4.494	-0.606

Source: Data from the research.

(-0.706). As for the attributes, the attribute AS1 (Staff make clients feel safe in negotiations) presented gap of -1.123, the attribute EM1 (Offer individualized care to clients) showed gap of -1.095, followed by AS2 (Staff who are polite with clients) with gap of -1.047, being all these attributes belonging to the responsiveness dimension.

5 Final considerations

From the attributes tested and validated, it was sought to identify the dimensions of service quality provided by the LBTEC, more specifically what concerns the ceramic brick and concreate block breaking service. This way, by means of Exploratory Factor Analysis, it was possible to identify three dimensions from a modified SERVQUAL scale. As previously observed, the SERVQUAL Scale consists of five dimension, which could not be identified in the present research. This result could be due to the small number of respondents (30 respondents), and so, compromising the quality of the results, or, also, because the respondents only identify three of the five dimensions proposed by the original scale in the service studied. This way, the respondents understand that the attributes of the services provided by LABTEC consist only of the dimensions Responsiveness, Assurance and Reliability.

The dimension Responsiveness has presented greater impact among the dimensions, with an explained variance of 64.791%. Such dimension has incorporated attributes related to all dimensions of the original SERVQUAL Scale. This dimension, mostly, refers to the ability of the staff to communicate with the clients and their relationship. Therefore, it is highlighted the need of training and qualification of the work team and the importance of the commitment of all involved in the service provision, what directly affects the perception of quality by the client.

The dimension Assurance has resulted in an explained variance of 7.244%. This dimension has incorporated just one attribute (Staff who know how to identify the clients' needs) originally belonging to the dimension empathy. A limitation in the research is that this dimension was formed by only one attribute and could not present a Cronbach's Alpha value, even though the composite reliability and the extracted variance were satisfactory.

The third dimension, named Reliability, has obtained an explained variance of 5.586%. In the study, the scale has incorporated items from the dimension reliability and tangibles too. It concerns to equipment, physical facilities, helpful staff and up-to-date registers. According to the results, this dimension has presented a gap difference of -0.706. Anyhow, considering that the gap is negative, it indicates the possibility of improvements mainly when it comes to physical facilities and helpful staff.

As managerial implications, this study signalizes the importance of evaluating the quality of services provided by knowledge intensive business services, as technology laboratories. This way, these service providers can identify the gaps resulting from their services and where they should concentrate their energy on, always concerning service quality and the customer satisfaction.

Additionally, as theoretical implications, it is possible to indicate, from the study results, that the SERVQUAL scale is still a recommended tool to determine service quality and customer satisfaction, although the dimensions from the original scale could not be identified by the present study, which indicates that a modified scale can be suitable in some situations. Despite the limitations found in this study, as the small sample, the results sign for a continuity of the evaluation of knowledge intensive

business services, as the one provided by the laboratory and evaluated in the present study. This way, new results could be compared to the ones found here and also adequate the scale used.

As a limitation of the study it can be pointed the small sample of respondents to the research. This is also a result of the small population (ceramic brick and concreate block breaking customers), since the laboratory only counts on 42 customers for this service and only 30 could be reached or be part of the research. Maybe, a wider sample could have shown different results, reinforcing the importance of validating the dimensions and attributes identified in this study.

In summary, the research results sign for the improvement of the services provided by the laboratory, specifically, what concerns the ceramic brick and concreate block breaking, adding value in the customer service and, consequently, empowering the increase of satisfaction. It is indicated the validation of the dimensions and attributes identified through the analyses of other services, as well as the longitudinal analyses of the service considered in the study. Additionally, it is suggested that, for future researches, the satisfaction of the customers with ceramic brick and concreate block breaking be evaluated as antecedent of retention and/or loyalty with the laboratory.

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